

THURSDAY, MAY 31, 1900.

A LIFE OF SCHÖNBEIN.

Christian Friedrich Schönbein, 1799-1868. Ein Blatt zur Geschichte des 19. Jahrhunderts. Von Georg W. A. Kahlbaum und Ed. Schaer. I. Theil. Pp. xix+230. (Leipzig: Johann Ambrosius Barth, 1900.)

THIS work forms the fourth part of the series of monographs on the history of chemistry being published under the editorship of Prof. Kahlbaum, of Bâle, whose qualifications for the task have already been made known to English men of science in the notices of two of his earlier volumes published recently in these columns.¹ The present instalment covers the period from the time of Schönbein's birth to the year 1849, and is divided into four sections, which comprise respectively the intervals 1799-1820, the "Wanderjahre" 1820-1828, the residence at Bâle from 1828 till the discovery of the passivity of iron towards the end of 1835, and the prosecution of the researches on the latter subject and on cognate electrical subjects from 1836 till 1849. There is a supplementary section dealing with Schönbein as a teacher and friend, which is by no means the least interesting part of the present volume. A perusal of the work will not only convince its readers that Schönbein was altogether a remarkable man as a thinker and experimenter, but that his personality and work could not have fallen for delineation and estimation into any better or more appreciative hands than those of Dr. Kahlbaum and his colleague.

The subject of the present biography was born at Metzingen, in Schwabia, on October 18, 1799. Passing over his boyhood, it appears that in his fourteenth year he made his first start in life as a pupil in the chemical and pharmaceutical factory of Metzger and Kaiser at Böblingen, so as to become a practical chemist. He suffered much at first from home-sickness, which, the authors tell us, is a purely German ailment:—

"Das bittere Leid des Heimwehs, dieser ächt deutschen Krankheit, die Engländer und Franzosen haben kaum ein eigenes Wort dafür, &c."

After seven years in this factory, he went, in 1820, into Dr. J. G. Dingler's factory for chemical products at Augsburg, on which occasion it is noteworthy that he underwent his only examination, and obtained his only certificate from Dr. Kieltmeyer, of Stuttgart. The original document, which has been obtained by Dr. Kahlbaum, testifies that at that time Schönbein was possessed of a good scientific and practical knowledge of chemistry. Dr. Dingler's letter, setting forth the qualifications which he expected on the part of the young man whom he was thinking of engaging, is dated March 20, 1820, and as a revelation of the state of affairs in a German establishment during the early part of the nineteenth century, it will repay careful perusal. The chemist required by him was to have scientific rather than ordinary routine chemical knowledge; he was to have at the same time something more than a superficial acquaintance with chemistry, in order that he might be able to carry out the analytical work required of him; he was to have a knowledge of

languages, so as to be able to translate, at least from French; he was to be possessed of moral rectitude, and to be entirely worthy of confidence. He was to come on probation for fourteen days, and if not found suitable he was to be sent back "carriage paid" ("bei Vergütung der Reisekosten"). If found suitable, he was to be boarded and lodged, and to receive from 200 to 300 florins per annum, with an increase to follow.

As the editor points out, Schönbein must have made good use of his time at Böblingen, since he seems to have come up to Dingler's requirements, and was appointed to the Augsburg factory; but before entering upon his duties he drew a fatal conscription number, and had to undergo a short term of military service. It appears, however, that he was soon discharged from this duty, through the intervention of the King, and in May 1820 he was "militärfrei."

The eight years from 1820-28 must have been years of great activity in Schönbein's early life. He remained only a few months at Augsburg, and then travelled from one University to another. His name is associated during this period with the Universities of Tübingen and Erlangen. While studying at the latter place, where he had Liebig for a contemporary, he was also holding the appointment of director in Adam's factory at Hemhofen, but finding that his factory work interfered with the prosecution of a regular course of study at the University, Mr. Adam relieved him of this work, and assisted him pecuniarily by appointing him tutor in his family.

Among many other interesting episodes in Schönbein's career at this period is his sojourn in England, which appears to have been the outcome of a taste for pedagogy inspired by his friend Christian Friedrich Wurm, who subsequently became professor of history in the Hamburg gymnasium—a man of many parts, a master of the English language and an ardent disciple of Pestalozzi, whose works he had translated into English. It was in 1826 that the young Schönbein entered the service of Dr. Mayo, who kept a school at Epsom, where Wurm was already engaged, for the purpose of imparting instruction in mathematics and natural philosophy on Pestalozzian principles in return for "50*l.* sterling per annum; with board, lodging and washing." The description of Dr. Mayo's establishment given by Wurm, and the criticisms which he makes upon the English educational methods of that time, are preserved in a letter to Schönbein written from Epsom in 1825, and published by Dr. Kahlbaum in the present volume. The editor comes to the conclusion that the Epsom academy was as far removed from the ideal Fröbel institute as the classical establishment of Dr. Blimbers at Brighton, in which young Paul Dombey was "forced" to death. Schönbein appears, however, to have made the best of his opportunities while in England, and to have paid visits to London and to Scotland, making friends and acquaintances, and gleaned knowledge wherever he went. In 1827 he left for Paris, and a long extract from his diary of travel, reprinted in the present work, is full of most interesting comparisons of English with French modes of travelling, and of the personal characteristics of the two nations. While Anglophobia, judging from some of the correspondence received by Schönbein at that time,

¹ NATURE, February 8, p. 337; and March 29, p. 513.

appears even then to have existed in Germany, it is satisfactory to learn that he was never influenced by it :—

“Dann war gerade ihm der afflammende Strohfeuer-enthusiasmus der Franzosen nicht sympathisch, sein deftiges, bedachtes Wesen war sehr wohl, wir haben das ja gesehen, begeisterungsfähig und hingebend, aber, wie sein Humor nichts von dem sprühenden Feuerwerk französischen Esprits hatte, so wenig trat sein Enthusiasmus als schnell verrauschende Schwärmerei auf. Die langsame niedersächsische Art der Engländer war ihm, dem Schwaben, darum viel herzwärmer als das griechische Feuer der Franzosen.”

It is, in fact, quite remarkable to find throughout this biography how warmly Schönbein felt himself in sympathy with England and English people. Faraday, Grove and Graham were his intimate and life-long friends. He appears to have gone to Paris under the same conditions and for the same purpose that he came here—to acquire a more intimate knowledge of the language, and to gain some insight into French pedagogy. The school in Paris, kept by a M. Rivail, in which he temporarily became a teacher, was unsatisfactory from every point of view, and on the whole the young German seems to have had anything but a pleasant time in the French capital about that period. But there, as elsewhere, he made the best of his opportunities by attending lectures at the Sorbonne, where he came under the influence of Gay-Lussac and Thénard, Biot, Dumas, Pouillet, Brongniart, &c., and by the time he returned to England to stay with his friend and Epsom colleague, Barron, at Stanmore, his appreciation of France and the French had considerably increased. Schönbein's views on the nature and constitution of Polytechnics, and his letters to Wurm written from Paris, and giving his experience of the Sorbonne and its professors, are full of interest.

In 1827, Merian, the professor of physics and chemistry at Bâle, was taken ill, and a substitute had to be found to carry on his duties. The post was first offered to Schönbein's friend, Engelhart, then also in Paris, who was unable to accept it, and afterwards to Schönbein, who was in England, and who finally undertook the duties, thus severing himself from this country, apparently to his regret, and becoming attached, in 1828, to that University, on which he ultimately shed such lustre. The first years of his connection with Bâle were unsettled by the provisional character of his appointment, and were further troubled by political disturbances, during which Schönbein himself bore arms, and it was not till February 1832 that he made his first communication to the scientific society of that town. This paper dealt with the classification of the elements into metals and non-metals, the former being defined as those elements which form basic oxides, and the latter those which form acid oxides. A few other papers followed during the years 1833–1835; one on the Pepys gas-holder, one on polarised light, one on an *ignis fatuus* observed at Bärenthal in the Black Forest, and one on the isomerism of chemical compounds. With the clearing of the political atmosphere and the cessation of hostilities, the University of Bâle underwent reorganisation, and Schönbein was appointed ordinary professor of physics and chemistry in 1834. His marriage took place the following year, towards the end of

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which (December 23, 1835) he made known to the “Naturforschenden Gesellschaft” his memorable work on the behaviour of tin and iron towards nitric acid, later communications on the passive state of iron and other metals having been made on January 21 and March 3, 1836.

The observation which formed the starting-point of Schönbein's researches appears to have been made by many previous investigators, among whom our own countryman, James Keir, F.R.S. (*Phil. Trans.* 1794) is given the priority. The period covered by the next section of the present work, viz. from 1836 to 1849, was full of activity and productiveness on the part of Schönbein, whose development of ideas, from his first experiments on the “passive” state of metals through all their ramifications into the various fields of electro-chemistry, is followed out and set forth by Dr. Kahlbaum with a masterly hand. As we are at this period well within what might be called the public aspect of Schönbein's work, when his results were being continuously published and discussed throughout the scientific world, it is unnecessary to dwell at any greater length upon the contents of the present instalment of his biography. It will interest English readers particularly to find how skilfully the authors trace the influence of Schönbein's correspondents, and particularly Faraday, upon his work. This work centred round the subjects of the origin of the electric current and the polarisation of the electrodes. The great controversy between the “chemical” and the “contact” theories of electromotive force was then raging, and it is now a matter of history how ably and staunchly Schönbein advocated the former. Most clearly are his views expressed in the extracts from his correspondence with Faraday, Poggendorff, Grove, De la Rive and others which the authors have brought together in this biography. Now and again passages occur which are really prophetic, such, for example, as his statement concerning the possible utility of the “Voltaic cell” in organic chemical investigation,¹ and his remarks² on the desirability of there being a more frequent blending of physics and chemistry in the same individual, as exemplified by Berzelius, Gay-Lussac, De la Rive, Becquerel, Daniel and Grove. Dr. Kahlbaum points to the modern school of physical chemistry as the embodiment of this wish.

In the concluding section, Schönbein's position in the world of science, as deduced from his own statements, is most instructively summed up. He was something more than a “physicist” or “chemist” :—

“Also Schönbein war nichts weniger als ein kritikloser Anhänger der Naturphilosophie im gewöhnlichen Sinne des Wortes, als der er im allgemeinen verschrien ist, aber er war eine durch und durch philosophisch angelegte Natur mit gefülltem philosophischem Schulsack und gut geschultem Denken, die eben immer aus theoretischen Ansichten heraus ihre Arbeiten unternahm.”

This judgment is borne out by an extract relating to his work on ozone contained in a letter written to Liebig in 1866, in which he states that, although the detection of a peculiar smell in electrolytic oxygen was accidental, all that has since proceeded from this observation cannot be ascribed to accident.

¹ *Pogg. Ann.* 1839, xlvii. 583.

² *Beiträge zur physikalischen Chemie*, 1844.

Among the many interesting aspects of Schönbein's life and work dealt with in this section is his dislike for organic chemistry already referred to in his correspondence with Faraday. Dr. Kahlbaum, we may add, endorses this opinion with some very strong remarks of his own (pp. 204-205), which will, no doubt, be forgiven by the "Herren Organiker" in view of the very important service to the history of nineteenth century science which he is rendering by these biographical contributions. Then, again, one cannot but be struck by the versatility of Schönbein's genius as revealed by the narration of his connection with journalism. That the illustrious Bâle professor was possessed of great literary power is made clear by his biographer. It is worthy of record that Schönbein attended the Birmingham meeting of the British Association in 1839, and the Cambridge and Southampton meetings in 1845 and 1846; of the first of these he gave an account in his "Reisetagebuch eines deutschen Naturforschers," of which extracts in English were published in the *Athenæum*. As an excellent example of his literary style may be mentioned the charming description of Easter festivities in Germany, written in English to Faraday in 1856. With respect to the literary style and method of publishing his scientific writings, there is a long and interesting critical letter from De la Rive in 1839, in which he reproaches Schönbein for being too diffuse, for writing too much and at too great a length, for introducing too often unverified suppositions, and, in fact, as we should say at the present time, for transferring the contents of his laboratory notebooks to the pages of his published memoirs:—

"C'est une voie tentative, à la tête de laquelle est Faraday dans ce moment, qui publie, publie le journal de ses expériences, aussi voyez le peu d'effet que font ses travaux sur le continent."

This criticism, by the way, is endorsed by Dr. Kahlbaum, who regrets that the Germans, "on account of its foreign origin," should have imitated a style which he characterises as incivility (*Unhöflichkeit*) to the readers.

Enough has been gleaned from this volume to show our readers that as a contribution to the history of the science of the nineteenth century, it is in no way inferior to its predecessors.

R. MELDOLA.

PROFESSOR TAIT'S SCIENTIFIC PAPERS.

Scientific Papers. By Peter Guthrie Tait, M.A., Sec. R.S.E. Vol. ii. Pp. xiv + 500. (Cambridge: At the University Press, 1900.)

PROF. TAIT is to be congratulated on the energy with which this reprint is being pushed forward. The first volume, noticed in *NATURE*, vol. lx. p. 98, is already followed by a second, so that the completion of the work at an early date may be anticipated.

The present instalment contains two considerable experimental investigations; one of these, on the compressibility of water at very high pressures, was suggested by a previous research on the *Challenger* thermometers; for the second, on impact, we are indebted to the author's well-known interest in golf. There is also a very interesting discussion of the cause of the "soaring" flight of a golf ball.

The most important theoretical research consists of a revision of the kinetic theory of gases, from the old standpoint of elastic spheres. All students of this intricate subject will be glad to have Prof. Tait's acute examination of it in the present compact form. It is interesting to note, by the way, the author's frank confession: "I have . . . abstained from reading the details of any investigation (be its author who he may) which seemed to me to be unnecessarily complex. Such a course has, inevitably, certain disadvantages, but its manifest advantages far outweigh them!" Let us hope that no indolent reader will be tempted to turn against Prof. Tait himself a *dictum* which conveys a very salutary warning to authors!

One of the most useful features of this reprint is the number of short papers which to many readers will now become known for the first time. There are also included a few biographical notices, as well as articles from the "Encyclopædia Britannica." In a note to the article on "quaternions" we are told that the sketch of the subject recently given by Prof. Klein in the "Theorie des Kreisels" rests on a misapprehension. This is one disappointment the more for those students who have vainly striven time after time to get a clear notion of what a quaternion really is, and who hoped that they had found at last something like a clear and compact and intelligible account of the matter. If, in spite of the fact that "the grandest characteristic of quaternions is their transparent intelligibility," men like Cayley and Klein are declared to have gone astray, one may be excused for asking whether there may not be something wanting after all in the official presentations of the subject?

The paper on the laws of motion hardly addresses itself to points on which a modern reader would seek enlightenment. Instead, we have verbal questions as to the meaning of "force" and the proper translation of certain phrases of Newton. Are not such questions disposed of once for all by the simple statement that since the time of Newton scientific people have specialised their usage of the word "force"? Although this has not been an unmixed advantage, it is probably now irrevocable. Still, one may reasonably urge that it is hardly fair to take a popular term, used in a great variety of senses, to attribute it for special purposes one and only one of these, and then to denounce as ignorant any one who continues to use it in its former latitude. The scorn, for example, which has been called forth by the term "centrifugal force" has often been most unjust, the physical notions of the users being clear enough, although they were not expressed in the conventional phraseology. The endless discussions which have been inflicted on us as to the meaning of the word "weight," furnish another instance of the trouble which may be wrought by specialists attempting to usurp functions which do not properly belong to them.

The last paper in the volume, on the teaching of natural philosophy, contains matter which probably hardly any one would question. Yet it well deserves reprinting, if only for the passage near the end which speaks of "the fatal objections to the school-teaching of physical science," based on the intrinsic difficulties of the subject, and the maturity of mind required to overcome them. Any one who is aware of the futility and the pedantry of